

The claims:

- 1) Coded data for disposal on or in a surface, the coded data being arranged in accordance with at least one layout having  $n$ -fold rotational symmetry about a center of rotation, where  $n$  is at least two, and having mirror symmetry, the layout including:
  - (k)  $n$  identical first sub-layouts rotated  $1/n$  revolutions apart about the center of rotation, and,
  - (l)  $n$  identical second sub-layouts rotated  $1/n$  revolutions apart about the center of rotation, each second sub-layout being a reflection of a corresponding one of the first sub-layouts, at least one sub-layout including:
    - (i) rotation-indicating data that distinguishes that sub-layout from at least one other sub-layout; and,
    - (ii) reflection-indicating data that distinguishes the reflection of that sub-layout from the reflection of a corresponding reflected sub-layout.
- 2) The coded data of claim 1, each second sub-layout being a reflection of a corresponding first sub-layout about a symmetry axis, the symmetry axis passing through the center of rotation.
- 3) The coded data of claim 1, the rotation-indicating data of each sub-layout being adapted to distinguish the rotation of the sub-layout from the rotation of each other sub-layout.
- 4) The coded data of claim 1, the reflection-indicating data being adapted to distinguish the reflection of a respective sub-layout from the reflection of each other sub-layout within the layout.
- 5) The coded data of claim 1, the coded data being redundantly encoded.
- 6) The coded data of claim 5, the coded data being redundantly encoded using Reed-Solomon encoding.
- 7) The coded data of claim 1, the coded data including at least one codeword associated with each layout, the codeword being encoded in each sub-layout.
- 8) The coded data of claim 1, the coded data including a plurality of layouts, each layout having at least one codeword that is different to at least one codeword of at least one other layout.
- 9) The coded data of claim 1, the coded data including a plurality of layouts, each layout having at least one codeword that is identical to at least one codeword of at least one other layout.
- 10) The coded data of claim 1, each sub-layout having at least one codeword that is different to at least one codeword of at least one other sub-layout.

- 11) The coded data of claim 1, each sub-layout having at least one codeword that is identical to at least one codeword of at least one other sub-layout.
- 5 12) The coded data of claim 1, each sub-layout having a codeword formed from a number of data elements, each sub-layout defining the positions of the data elements.
- 13) The coded data of claim 12, the sub-layouts being arranged such that each data element has a unique position.
- 10 14) The coded data of claim 12, the positions of the data elements of respective sub-layouts being interleaved.
- 15) The coded data of claim 1, the layout having at least one of the following shapes:
- 15 (a) linear;  
(b) square;  
(c) rectangular;  
(d) triangular; or  
(e) hexagonal.
- 20 16) The coded data of claim 1, each layout including at least one target feature.
- 17) The coded data of claim 16, the at least one target feature being used to determine at least one of the location of the layout and rotation of the layout.
- 25 18) The coded data of claim 16, the coded data being adapted to be sensed using a sensing device, the target feature being configured to enable perspective correction of the coded data as sensed by the sensing device.
- 30 19) The coded data of claim 16, each layout including at least four target features.
- 20) The coded data of claim 16, the coded data including a plurality of layouts, at least some target features being common to at least two layouts.
- 35 21) The coded data of claim 1, the coded data including a plurality of layouts arranged over the surface in accordance with a super-layout.
- 22) The coded data of claim 21, the super-layout being arranged such that there is a predetermined spacing between adjacent layouts in the super-layout.

- 23) A surface bearing machine-readable coded data, the coded data being arranged in accordance with at least one layout having  $n$ -fold rotational symmetry about a center of rotation, where  $n$  is at least two, and having mirror symmetry, the layout including:
- 5 (a)  $n$  identical first sub-layouts rotated  $1/n$  revolutions apart about the center of rotation, and,
- (b)  $n$  identical second sub-layouts rotated  $1/n$  revolutions apart about the center of rotation, each second sub-layout being a reflection of a corresponding one of the first sub-layouts, at least one sub-layout including:
- 10 (i) rotation-indicating data that distinguishes that sub-layout from at least one other sub-layout; and,
- (ii) reflection-indicating data that distinguishes the reflection of that sub-layout from the reflection of a corresponding reflected sub-layout.
- 24) A surface according to claim 23, the coded data being substantially invisible to the unaided human eye.
- 15 25) A surface according to claim 23, the surface further including additional visible markings.
- 26) A surface according to claim 23, the surface being configured as an interface surface for enabling user interaction with a computer.
- 20 27) A surface according to claim 23, the surface including at least one region and the coded data representing an identity of the at least one region.
- 28) A method of generating an interface surface, the method including the steps of:
- 25 (a) receiving user data in a printer;
- (b) generating machine-readable coded data incorporating the user data, the coded data being arranged in accordance with at least one layout having  $n$ -fold rotational symmetry about a center of rotation, where  $n$  is at least two, and having mirror symmetry, the layout including:
- 30 (i)  $n$  identical first sub-layouts rotated  $1/n$  revolutions apart about the center of rotation, and,
- (ii)  $n$  identical second sub-layouts rotated  $1/n$  revolutions apart about the center of rotation, each second sub-layout being a reflection of a corresponding one of the first sub-layouts, at least one sub-layout including:
- 35 (1) rotation-indicating data that distinguishes that sub-layout from at least one other sub-layout; and,
- (2) reflection-indicating data that distinguishes the reflection of that sub-layout from the reflection of a corresponding reflected sub-layout.
- (c) printing the coded data onto a surface.
- 29) A method according to claim 28, the coded data being substantially invisible to the unaided human eye.

30) A method according to claim 28, the surface further including additional visible markings, the method including printing visible markings on the surface substantially simultaneously with the coded data.

5 31) A method of using a sensing device to read machine-readable coded data, the coded data being arranged in accordance with at least one layout having  $n$ -fold rotational symmetry about a center of rotation, where  $n$  is at least two, and having mirror symmetry, the layout including:

(i)  $n$  identical first sub-layouts rotated  $1/n$  revolutions apart about the center of rotation, and,  
10 (ii)  $n$  identical second sub-layouts rotated  $1/n$  revolutions apart about the center of rotation, each second sub-layout being a reflection of a corresponding one of the first sub-layouts, at least one sub-layout including:

(1) rotation-indicating data that distinguishes that sub-layout from at least one other sub-layout; and,  
15 (2) reflection-indicating data that distinguishes the reflection of that sub-layout from the reflection of a corresponding reflected sub-layout.

(b) sensing at least one layout using the sensing device;  
(c) decoding the coded data of at least one of the sub-layouts of the sensed layout, thereby determining at least the rotation-indicating data of that sub-layout; and  
20 (d) using the rotation-indicating data to interpret the meaning of at least some of the coded data.

32) A method according to claim 31, each layout including at least one target feature representing at least a position and a rotation of the layout, the method of reading the coded data including:

(a) imaging the surface to generate an image thereof;  
(b) processing the image to locate one or more target features; and  
25 (c) on the basis of the located target features, determining at least one of the position and the rotation of at least one of the sub-layouts.

33) A method according to claim 31, each layout including a codeword, the codeword being encoded in each sub-layout, the method including decoding the codeword from at least one of the sub-layouts.

30 34) A method according to claim 31, at least one sub-layout including type-indicating data, the method including:

(a) determining at least the type-indicating data of the at least one sub-layout; and,  
35 (b) using the type-indicating data to interpret the meaning of at least some of the coded data.

35 35) Coded data for disposal on or in a surface, the coded data being arranged in accordance with at least one layout having  $n$ -fold rotational symmetry about a center of rotation, where  $n$  is at least two, the layout including  $n$  identical sub-layouts rotated  $1/n$  revolutions apart about the center of rotation, each sub-layout encoding a codeword formed from a number of data elements, the sub-layout defining the

position of the data elements, and including rotation-indicating data that distinguishes that sub-layout from at least one other sub-layout.

5      36) The coded data of claim 35, the sub-layouts being arranged such that each data element has a unique position.

37) The coded data of claim 35, the positions of the data elements of respective sub-layouts being interleaved.

10     38) The coded data of claim 35, the coded data including a plurality of layouts, each layout having at least one codeword that is different to at least one codeword of at least one other layout.

39) The coded data of claim 35, the coded data including a plurality of layouts, each layout having at least one codeword that is identical to at least one codeword of at least one other layout.

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40) The coded data of claim 35, each sub-layout having at least one codeword that is different to at least one codeword of at least one other sub-layout.

20     41) The coded data of claim 35, each sub-layout having at least one codeword that is identical to at least one codeword of at least one other sub-layout.

42) The coded data of claim 35, the coded data being coded data according to claim 1.

25     43) A surface bearing machine-readable coded data, the coded data being arranged in accordance with at least one layout having  $n$ -fold rotational symmetry about a center of rotation, where  $n$  is at least two, the layout including  $n$  identical sub-layouts rotated  $1/n$  revolutions apart about the center of rotation, each sub-layout encoding a codeword formed from a number of data elements, the sub-layout defining the position of the data elements, and including rotation-indicating data that distinguishes that sub-layout from at least one other sub-layout.

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44) A surface according to claim 43, the coded data being substantially invisible to the unaided human eye.

45) A surface according to claim 43, the surface further including additional visible markings.

35     46) A surface according to claim 43, the surface being configured as an interface surface for enabling user interaction with a computer.

47) A surface according to claim 46, the surface including at least one region and the coded data representing an identity of the at least one region.

- 48) A surface according to claim 46, the surface being a surface according to claim 23.
- 49) A method of generating an interface surface, the method including the steps of:
- 5 (a) receiving user data in a printer;
- (b) generating machine-readable coded data incorporating the user data, the coded data being arranged in accordance with at least one layout having  $n$ -fold rotational symmetry about a center of rotation, where  $n$  is at least two, the layout including  $n$  identical sub-layouts rotated  $1/n$  revolutions apart about the center of rotation, each sub-layout encoding a codeword formed from a number of data elements, the sub-layout defining the position of the data elements, and including rotation-indicating data that distinguishes that sub-layout from at least one other sub-layout.
- 10 (c) printing the coded data onto a surface.
- 50) A method according to claim 49, the coded data being substantially invisible to the unaided human eye.
- 15 51) A method according to claim 49, the surface further including additional visible markings, the method including printing visible markings on the surface substantially simultaneously with the coded data.
- 52) A method according to claim 49, the method being a method according to claim 28.
- 20 53) A method of using a sensing device to read machine-readable coded data, the coded data being arranged in accordance with at least one layout having  $n$ -fold rotational symmetry about a center of rotation, where  $n$  is at least two, the layout including  $n$  identical sub-layouts rotated  $1/n$  revolutions apart about the center of rotation, each sub-layout encoding a codeword formed from a number of data elements, the sub-layout defining the position of the data elements, and including rotation-indicating data that distinguishes that sub-layout from at least one other sub-layout.
- 25 (a) sensing at least one layout using the sensing device;
- (b) decoding the coded data of at least one of the sub-layouts of the sensed layout, thereby determining at least the rotation-indicating data of that sub-layout; and
- 30 (c) using the rotation-indicating data to interpret the meaning of at least some of the coded data.
- 54) A method according to claim 53, each layout including at least one target feature representing at least a position and a rotation of the layout, the method of reading the coded data including:
- (a) imaging the surface to generate an image thereof;
- 35 (b) processing the image to locate one or more target features; and
- (c) on the basis of the located target features, determining at least one of the position and the rotation of at least one of the sub-layouts.

55) A method according to claim 53, each layout including a codeword, the codeword being encoded in each sub-layout, the method including decoding the codeword from at least one of the sub-layouts.

5 56) A method according to claim 53, at least one sub-layout including type-indicating data, the method including:

- (a) determining at least the type-indicating data of the at least one sub-layout; and,
- (b) using the type-indicating data to interpret the meaning of at least some of the coded data.

10 57) A method according to claim 53, the method being a method according to claim 31.